D. REMARKS/ARGUMENTS

1. Objection to the Specification

The Examiner has objected to a typographical error on paragraph [0050], line 7.

In response, Applicant has amended paragraph [0050] line 7 of the disclosure (see section B above) and submits that this amendment overcomes this objection.

2. Claim Objections

Claims 1, 16, and 18 have been objected to because of various informalities. Applicant has amended claims 1, 16, 18 (see section C), and submits that these amendments overcome these objections.

3. Rejection of Claims under 35 U.S.C. § (112) ¶ 1

Claims 1, 2, 4-17, and 9-22 stand rejected under 35 U.S.C. 112, first paragraph, because the specification, while being enabling for determining voltage between a cathode and an x-ray emissive target, does not reasonably provide enablement for determining the operating voltage for other components in an x-ray apparatus.

Applicant respectfully traverses.

Applicant submits that, as explicitly described in Applicant's disclosure, and as recited in some of the claims, the x-ray source operating voltage is in fact exactly the voltage between the cathode (i.e. electron source) and the x-ray emissive target (which the Examiner states as being enabled by Applicant's specification). As clearly explained in Applicant's specification and explicitly recited in some of the claims, the x-ray source operating voltage kVp (also referred to as the x-ray tube operating voltage kVp) is simply the voltage between the cathode and the target, which determines how much the electrons are accelerated toward the x-ray emissive target, causing the target to emit x rays. Naturally, the more the electrons are accelerated, the greater the energy

of the x rays that are emitted from the target. This is why the voltage between the cathode and the x-ray emissive target is the x-ray source operating voltage.

See e.g. specification paragraph [0024] , 5th line: ". . . *The kVp of the x-ray source 14, i.e. the x-ray source operating voltage, provides the accelerating voltage for accelerating the electrons from the electron source towards the x-ray emissive target 30.* . . . "; paragraph [0027], 4th line: ". . . *a higher operating voltage (i.e. kVp) produces higher energy x rays* . . . " claim 3: ". . . *said operating voltage is the accelerating voltage between an electron source and an x ray emissive target within said x-ray source."*

For these reasons, Applicant submits that the rejection of claims 1, 2, 4 - 17, and 9 22 under 35 U.S.C. 112, first paragraph, has been overcome, because 1) the x ray source operating voltage is simply the accelerating voltage between the cathode and the x ray emissive target, and 2) Applicant's specification is enabling for determining the voltage between a cathode and an x ray emissive target, as acknowledged by the Examiner in the Office Action.

4. Rejection of Claims under 35 U.S.C. § (102)

Claims 1, 2, 7, 8, 11, and 15 are rejected under 35 U.S.C. 102(b) as being anticipated by U.S. Patent No. 6,501,819 B2) to Unger et al. ("Unger").

Applicant respectfully traverses.

In the Office Action, the Examiner states:

"With regard to claim 1, Unger *et al.* disclosed a method for optimizing radiographic image quality by irradiating the object with x-rays from an x-ray apparatus during an initial period of an x-ray exposure, the method comprising:

A. determining a first operating voltage level kVp_0 for initial operation of the x-ray apparatus (default exposure settings, column 4, lines 7-14);

B. during a first sampling interval Δt_1 in the beginning of the x-ray exposure period, operating the x-ray apparatus at the first voltage level kVp_0 and using one or more sensors to detect x-rays that have passed through at least a portion of the object during the interval Δt_1, (first image, column 4, lines 7-14);

C. after the first sampling interval Δt_1, processing the output signals from the sensors to determine a second operating voltage level kVp_1 (column 5, lines 22-33);

D. during a second sampling interval Δt_2, operating the x-ray apparatus at the second voltage level kVp_1 and using the sensors to detect x-rays that have passed through at least a portion of the object during the interval Δt_2 (second image, column 5, lines :34-36);

E. after the second sampling interval Δt_2, processing the sensor output signal s to determine an optimal value kVp_2 for the operating voltage level, and setting the operating voltage level of the x ray apparatus to the optimal value kVp2 for the remainder of the x ray exposure period (adjusting exposure settings of 3rd image based on 2nd image, column 8, lines 25-27)."

Claim 1

Applicant submits that the subject matter of Unger is very different from what Applicant discloses in the specification and claims in claim 1. In particular, Unger fails to teach or suggest at least elements B, C, D, and E of claim 1.

Applicant discloses improving the quality of an image, obtained during a single x ray exposure period, by operating the x ray apparatus at different operating voltages during sampling intervals that are much smaller than the single x ray exposure period of that image, and using output signals obtained during the last sampling interval to determine the optimal operating voltage to be used during the remainder of the x ray

exposure period.

Unger discloses none of this. In contrast, Unger discloses implementing at least two x ray exposures of a patient, obtaining respectively different images. In particular, a first image is obtained from the first exposure, and the first image is segmented into an anatomy of interest. A second image is obtained from a second exposure, this time of the segmented anatomy.

Nowhere in Unger is there any teaching or suggestion of operating the x ray apparatus at the first operating voltage level during a first sampling interval (that is much smaller than the x ray exposure period), determining a second operating voltage, operating the x ray apparatus at a second operating voltage level during a second sampling interval (also much smaller than the x ray exposure period), determining an optimal operating voltage, and operating the x ray apparatus at the optimal operating voltage during the remainder of the x-ray exposure period, as required by claim 1.

Element B is not anticipated by "first image, column 4, lines 7-14" of Unger, because column 4 lines 7 14 of Unger describe an acquisition of an entire first image, not the operating of an x ray apparatus during a first sampling interval that is much less that the x ray exposure period. See e.g. Applicant's specification paragraph [0033], last line: "*The sampling interval is small, compared to the duration of the entire x-ray exposure.*"

Likewise, element C is not anticipated by "column 5, lines 22 33" of Unger, which describe selecting second image paratmeters based on the characteristics of the anatomy, not determining a second operating voltage level for a same image by processing output signals from the sensors during a sampling interval that is small, compared to the duration of the x ray exposure period for the same image.

Likewise, element D is not anticipated by "second image, column 5, lines :34 36" of Under, which describe using second image acquisition settings to obtain a second image, not operating the x ray apparatus at a second voltage levelduring a se cond sampling interval that is much less than the x ray exposure period of the same ima ge.

Finally, element E is not anticipated by "adjusting exposure settings of 3rd image based on 2nd image, column 8, lines 25 27" of Unger, which as noted by the Examiner d escribed adjusting the exposure settings of a 3rd image (different from the first and second images) based on a second image (different from the first and the third images). This kind of disclosure in Unger is completely different from element E. Element E of cl aim 1 recites determining an optimal value for the operating voltage level, and setting the operating voltage level of the x ray apparatus to that optimal value for the remainder of the single x ray exposure period. Nothing in Unger teaches or suggests any of this.

For these reasons, claim 1 is not anticipated by Unger.

Claims 2, 7, 8, 11, and 15

Claims 2, 7, 8, 11, and 15 all depend on claim 1, and therefore include all the limitations of claim 1. Claims 2, 7, 8, 11, and 15 are therefore also not anticipated by Unger.

5. Rejection of Claims 3, 5, and 6 under 35 U.S.C. § (103)

Claims 3 and 5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Unger *et al.* (U.S. Patent No. 6,501,819 B2) as applied to claim 2 above, and further in view of Macovski (U.S. Patent No. 4,686,695). Claim 6 is rejected under 35 USC 103 as obvious over Unger.

Applicant respectfully traverses. Applicant submits that claims 3 and 5, which

depend on claim 1, are not obvious over Unger in view of Macovski, because claim 1 is not obvious over Unger in view of Macovski. Applicant submits that claim 6, which depends on claim 1, is not obvious over Unger because claim 1 is not obvious over Unger.

Claim 1 is not obvious over Unger in view of Macovski, nor is claim 1 obvious over Unger

Applicant submits that, for the reasons discussed below, a *prima facie* case of obviousness of claim 1 has not been established, and therefore that applicant is under no obligation to submit evidence of nonobviousness. See MPEP 2142 ("The examiner bears the initial burden of factually supporting any *prima facie* conclusion of obviousness. If the examiner does not produce a prima facie case, the applicant is under no obligation to submit evidence of nonobviousness.")

It is well known that, in order to establish a *prima facie* case of obviousness, a rej ection must satisfy at least the following:

A) The prior art reference(s) must teach or suggest all of the elements and limitations recited in the claims.

For the reasons described above, Unger does not teach or suggest all the limitations of claim 1, and fails to teach or suggest at least elements B – E of claim 1.

Macovski fails to cure this defect. Macovski does not teach any of the elements of claim 1, and the Examiner also does not state that Macovski teaches any of the elements of claim 1.

Because Unger and Macovski, either alone or in combination, fails to teach or suggest all the limitations of claim 1, claim 1 is not obvious over Unger in view of Macovski, nor is claim 1 obvious over Unger.

It is well known that "[i]f an independent claim is nonobvious under 35 U.S.C. 103, then any claim depending therefrom is nonobvious." MPEP 2143.03; In re Fine, 837 F.2d 1071, 2 USPQ2s 1596 (Fed. Cir. 1988).

Claims 3, 5 and 6 all depend on claim 1, and therefore include all the limitations of claim 1. For all the reasons discussed above, claim 1 is nonobvious under 35 U.S.C. 103 over Unger in view of Macovski. Also, claim 1 is nonobvious under 35 U.S.C. 103 over Unger. Accordingly, it follows that claims 3 and 5 (all depending from claim 1) are also nonobvious under 35 U.S.C. 103 over Unger in view of Macovski, and that claim 6 is nonobvious under 35 USC 103 over Unger.

4. Conclusion

On the basis of the foregoing amendments, Applicant respectfully submits that all of the pending claims are in condition for allowance. An early and favorable action is therefore earnestly solicited. If there are any questions regarding these amendments and remarks, the Examiner is encouraged to contact the undersigned at the telephone number provided below.

Respectfully submitted,

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